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FIELD OF THE INVENTION

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so-called order or customer order which comprises, for example, a work envelope with an inserted film cartridge and the working instructions or processing information. Moreover the photo shop may add particular requests to the processing information, e.g. the request how the prints are to be sorted in a wallet. In this way, a plurality of "customer orders" are collected at the photo shop.

Each photo shop forwards the customer orders to a photographic laboratory (centralized organization). At this photographic laboratory, each order is processed by processing the customer order (e.g. film) according to the corresponding processing information (e.g. notes, bar codes, etc.) of the order.

The photo shop may forward the customer orders together with the corresponding processing information physically by means of work envelopes or digitally e.g. via internet. If the customer orders are received physically, the films included in the customer orders are scanned by a scanner in order to obtain digital images. If the customer orders are received digitally, e.g. via a data transmission line or via a data storage medium (e.g. CD, memory stick etc.), the images are already in digital form.

The digital images of a customer order are ordered according to a predetermined sequence which usually corresponds to the chronology of the picture making of the photographer. This applies for both cases, the processing of scanned image data and the processing of image data already received in digital form.

Following this predetermined sequence, the image data are fed to a printer which prints one image after the other. If the processing information of a customer

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to format. The APS formats are H (HDTV), C (classic) and P (panoramic). The corresponding print size is 4 x 7 (H), 4 x 6 (C) and 4 x 12 (P). Usually the final stack with the prints (complete print pack) is composed of a P pack, H pack and C pack. These three print packs are usually stacked together such that the C pack is on the top. Also in the case of conventional 35mm films (135), films with interspersed panoramic pictures are produced which have to be sorted. In order to solve this task, the finishing station comprising the cutter, sorter and buffer requires at least three bins. If the index print which shows thumb nail images of the customer order is to be set on top of the stack, an additional bin has to be provided.

The sorting task of the finishing system increases if the customer wants to have two or more copies of each print. In this case the customer usually wants two or more complete print packs, each complete print pack comprising the same (and all) pictures. This allows the customer to easily give one complete print pack to one person (e.g. a friend). In order to solve this problem a huge number of additional bins are necessary in a sorter. Alternatively a second sorter may be arranged before the final sorter, and having at least as much bins as copies of the same prints are requested, in order to collect prints of one packet in one bin before the final sorting according to format is performed by the final sorter.

SUMMARY OF THE INVENTION

It is one object of the invention to provide an apparatus, a method and a processing system which

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allow to simplify the finishing system in a photographic laboratory.

5 It is another object of the invention to provide a possibility to allow for a multiplicity of different sequences of prints.

10 The apparatus of the present invention arranges digitally digital images which he has received. Typically the digital images may be assigned to a customer order which corresponds to a certain number of different images. Then the apparatus transfers the images arranged according to a selectable sequence to the printer. Preferably the rearranging or sequencing of the digital images is performed for digital images of one customer order which are usually received according to a predetermined sequence (input sequence). In order to be able to sequence the digital image such that the sequence (output sequence) is optimal for the finishing, i.e. sorting and stacking of the prints, the apparatus of the present invention comprises preferably an image memory, which allows to store a plurality of digital images. Preferably the image memory has a capacity to store all images of one customer order (e.g. 20 to 50 images). Furthermore a determining unit is provided. This determining unit advantageously determines the output sequence, according to which the digital images of a customer order are to be output to the printer. For this purpose, the determining unit determines the positions of the digital images of the customer order in the output sequence. The determination of the positions is performed by referring to reference data.

25 The reference data are preferably stored in a memory in the sequencing apparatus but may also be

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input e.g. via an interface or data storage medium
drive (e.g. disk drive, CD-drive). The reference data
are data which are relevant for the sequencing process
or rearranging process. The reference data may relate
5 positions in a predetermined, received sequence to
positions in an output sequence and/or may give
information on preferred positions of received images
in the output sequence. The reference data may
correspond to or be based on the processing
10 information of the customer order assigned to the
digital images, which are to be sequenced or
rearranged in the output sequence. Thus the reference
data preferably include information about the format
of the print of each digital image of the customer
15 order and include information about the number of
times, each digital image has to be printed.
Furthermore, the reference data may represent the
rules according to which the sequencing has to be
performed, for instance, the rule that digital images,
20 which belong to one and the same format, should be
arranged next to each other, for instance, the rule
that digital images assigned to the C format should be
output at the beginning of the output sequence, and
for instance, the rule that, in the case each image
25 has to be printed several times several sets of
digital images should be arranged in the output
sequence one after the other while each set includes
all digital images of the customer order, thus
complete print packs may be achieved. These rules,
30 which may be stored in the apparatus, are preferably
changeable, e.g. by means of an operator interface
(e.g. screen and keyboard), which allows to set the

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rules e.g. depending on the sorting capabilities of the finishing apparatus or particular customer wishes.

5 If, for example, the finishing system is able to sort the prints according to format but is not able to provide double packs with two complete print packs or triple packs with three complete print packs, each pack having a complete set of digital images of one customer order, the sorting according to format has not to be performed by the sequencing apparatus of the present invention. In this case, the operator may amend the reference data such that the rules are changed such that the sequencing apparatus does not perform a sorting (sequencing) according to format but only according to sets such that two or three complete sets of digital images are arranged one after the other in the output sequence.

15 Sometimes the process information indicates that the customer does not want the predetermined (e.g. chronological) sequence to be altered. In this case, the reference data indicate based on the process information that the determining unit has to determine the position of the digital images according to the sequence in which the digital images have been received by the sequencing apparatus.

25 The image output of the sequencing apparatus of the present invention outputs the digital images according to the output sequence determined by the determining unit. For this purpose the image output preferably accesses the memory and selects one digital image after the other in the output sequence according to its designated position defined by the reference data. For this purpose the image output preferably comprises a (digital) buffer which allows to store one

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digital image which is output while the next one is selected according to the output sequence.

5 If the received image data are received together with the assigned processing information, if, for instance, the processing information is placed in a header of a data stream assigned to a customer order, the sequencing apparatus of the present invention preferably comprises a separation unit which allows to separate the processing information from the data stream and which allows to feed this processing information as reference data to the determining unit.

10 Preferably the rearranging of the digital images is not performed by restoring the digital images on different places in the memory until the physical sequence in the memory corresponds to the output sequence, but preferably the addressing of the digital images having a fixed location in the memory is rearranged instead. For instance, pointer technology may be used to access the digital images. For instance, a sequence of pointers may correspond to the (intended) output sequence. In this case, each pointer of the sequence is directed to the memory of a particular digital image such that the pointer sequence corresponds to the output sequence which has to be achieved according to the reference data.

25 Preferably the sequencing apparatus has a user interface, such as a screen, keyboard, mouth, microphone, speaker etc., which allows the user to input information into the sequencing apparatus and which may also allow the sequencing apparatus to prompt the user to input information. For instance, the user may be prompted by a menu to input information about the sorting capabilities of the

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apparatus and used as reference data. If the set of digital images belonging to one customer order has n digital images and, for example, k copies are to be made of the digital images, the determining unit of the sequencing apparatus of the present invention defines k positions for each single digital image in the output sequence, i.e. defines in summary $K \times n$ positions. If a digital image has a position i in the first set of digital images to be output, the same digital image is positioned at a position $i+n$, $i+2n$, and so on in the output sequence, until k identical digital images are positioned in the output sequence.

BRIEF DESCRIPTION OF THE DRAWINGS

In the following an embodiment of the invention will be described by referring to the accompanying figure. The figure shows a block diagram of a preferred embodiment of the sequencing apparatus of the present invention as well as of the processing system and illustrates the steps to be performed according to a method including features in accordance with the present invention.

DETAILED DESCRIPTION OF THE INVENTION

The photographic laboratory receives a film in a work envelope and separates the film from the work envelope. This film is assigned to a customer order and scanned by a scanner by scanning one frame of the film after the other. The sequence of the frames on the film determines the sequence of digital images output by the scanner 10 and input in the sequencing apparatus 100. Alternatively to the scanner 10 a digital image interface may be provided which may

receive digital images (and processing information) via a data transmission line (e.g. internet port) or via a storage medium (e.g. CD, disc, data tape).

5 The film of the customer order is typically accompanied by processing information (notes) which can be found on the work envelope. This notes describe the wishes of the customer or the retail shop concerning the processing of the film, in particular concerning the format of each print to be made and the
10 number of copies to be made of one image. The notes may be automatically, digitally processed by means of optical character recognition (OCR) or may be read by an operator and input in the system via keyboard and screen. Furthermore, in the case of APS film, the
15 magnetic information on the film cartridge is detected and analyzed. The magnetic information indicates for each picture whether the photographer wants the print in P, H or C format and also represents processing information. Preferably the digitalized processing
20 information is input into a processing information storage 160.

The sequence of digital images is received by the image input 110 and passed from the image input 110 to the image memory 120.

25 The image output 130 accesses the image memory and selects a particular image of the stored digital images from the image memory 120 according to instructions from the determining unit 150. This particular image is output to the printer 20. The
30 printer 20 prints the image e.g. by means of a conventional exposing system on a photographic paper web. The photographic paper web is cut in the finishing system 30. According to a preferred

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followed if there are no particular information in the processing information of the current customer order. If, for example, the processing information does not specify where copies of particular images have to be placed in the stack of prints. For instance, copies may be placed directly next to the print with the same image or copies may be placed in an extra pack which includes only copies. In this case, the determining unit will look in the data base whether the particular customer has already requested in a previous customer order in which way he prefers to handle copies. If there is such a particular profile for the customer in the data base, this profile over rules the aforementioned general default rules.

The sequencing apparatus of the present invention may be implemented by means of a computer or workstation. This computer has interfaces to input the sequence of digital images, processing information, external data as well as an output interface to output the digital images according to the output sequence to the printer and may additionally have interfaces to control the printer or finishing system. A program is loaded in the computer which causes the computer to perform the processing steps performed by the above described sequencing apparatus 100. In particular the program sequences the digital images according to the reference data in a manner as described above.